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HANFORD SITE

RICHLAND, WASHINGTON

U.S. DEPARTMENT OF ENERGY

TECHNICAL REVIEW OF DRAFT RI/FS WORK PLAN

200-BP-1 OPERABLE UNIT

by

U.S. ENVIRONMENTAL PROTECTION AGENCY
(Lead Regulatory Agency)

and

WASHINGTON STATE DEPARTMENT OF ECOLOGY
(Support Agency)

May 24, 1989

HANFORD SITE 200-BP-1 OPERABLE UNIT
RICHLAND, WASHINGTON
TECHNICAL REVIEW OF DRAFT RI/FS WORK PLAN

The following set of comments are divided into three general groups, identified as Group I, Group II, and Group III:
Group I: General comments regarding the adequacy of the work plan and adherance to EPA's established guidance and policy.

Group II: Comments specific to investigation, characterization, and monitoring of the vadose zone and the groundwater.

Group III: Comments from the Washington State Department of Ecology regarding adequacy of the overall work plan.

GROUP I

Section 2.2.3.1 (p. 2-21)

1) Deficiency - The depth to water is not given.

   Recommendation - The text should state that aquifer is over 70 m. (230 ft.) thick and depth to water is 70 m (230 ft.).

Section 3.1.3 Table 3-3 (p. 3-6)

2) Deficiency - Well data for well E299-E33-26 is missing.

   Recommendation - Well No. 299-E33-26 should be added to Table 3-3 as the text on p. 3-5 and Plate 3-1 indicate it is in the 200-BP-1 area.

3) Deficiency - The monitoring well numbers are not clear.

Recommendation - Well numbers in this table should be preceded by number 299. If there is a reason why 299 should not be preceded by the well number, it should be clarified in the text, otherwise the well numbers are confusing and questionable.

Section 3.1.3.8 (p. 3-15)

4) Deficiency - Proposed detection limits for Co^{60} and Ru^{106} do not appear adequate.

Recommendation - The data quality objectives for Co^{60} and Ru^{106} lab analyses should consider detection limits below the drinking water standards unless some justification is given to do otherwise.

Section 3.3.3 (p. 3-36) and Section 3.3.3.2 (p. 3-38)

5) Deficiency - Baseline risk assessment site conditions are not adequately justified.

Recommendation - A baseline risk assessment is based on existing site conditions without assumptions of institutional controls. Institutional controls being a legal access restriction or physical barriers (e.g., a fence at the property line). It would be inappropriate to presume that baseline risk assessments at any of the Hanford Site operable units consist of existing contamination being restricted by a fence maintained indefinitely. Use of a fence is in itself a remedial alternative option which should be evaluated along with other alternatives designed

to treat, store, or dispose of contaminated material. Consequently, the baseline risk assessment at this and any other operable units should not assume that an existing fence is going to preclude an exposure for direct contact. Furthermore, the baseline risk assessment should consider future land use scenarios such as potential recreational or agricultural use. Use of any other type of baseline risk assessment constitutes establishment of a DOE remedial action policy which is not consistent with the goals of Superfund.

Section 3.3.4.1, p. 3-45, 1st para.

6) Deficiency - This paragraph states likely exposure pathways with soil will be direct contact, but this statement is contradictory to Section 3.3.3.2, p. 3-38. Section 3.3.3.2 states direct contact is extremely unlikely.

Recommendation - The two paragraphs need to be reviewed to define direct contact risks and present a consistent discussion.

Section 3.4 (p. 3-50)

7) Deficiency - General response actions are not correctly used.

Recommendation - The terms general response actions, remedial technologies and process options are frequently incorrectly used. The "Interim Final Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA" (October 1988, OSWER Directive 9355.3-01) should be referenced. Generally speaking, technologies are a subset of general response actions and process options are

a subset of technologies. It is the process options, not the technologies, that are combined in the FS to form alternatives to be screened.

Section 3.4.2 (p. 3-51 2nd para.)

8) Deficiency - The text states that no specific technologies are identified, but this is not the case.

Recommendation - Tables 3-17 and 3-18 identify specific remedial technologies (e.g., capping) and remedial alternatives, respectively for ground water and soil. Technologies such as capping are considered to be specific. Therefore, the text should be corrected to state that there are specific remedial technologies and remedial alternatives planned.

Section 3.4.1, Table 3-16 (p.. 3-52 through 3-54)

9) Deficiency - The combination of technologies to develop general response actions is not fully developed.

Recommendation - General response actions should include response categories such as excavation, collection, containment and disposal. Caution should be exercised when combining them (i.e., excavation/treatment/disposal), since generic alternatives may be prematurely developed and may result in the elimination of viable alternatives. Some alternatives may also never be developed. For example, a process option such as soil washing may only reduce risk levels to say 10^{-3} for direct contact but in combination with a RCRA-type cap the risk level may drop to an acceptable 10^{-4}. With the approach taken in Table 3-16, this potential alternative would be overlooked.

Section 3.4.2, Table 3-17, p. 3-55 through 3-57

10) Deficiency - General response actions, technologies and process options are not properly differentiated.

Recommendation - Clarify tables based on the following comments. Excavation is a general response action. Mechanical excavation and pneumatic excavation are technologies. Excavation by backhoe or pneumatic dredger are process options. Vitrification is a process option and is a subcategory of either physical treatment or thermal treatment. Physical treatment and thermal treatment would be subcategories of the treatment general response action.

Section 4.0

11) Deficiency - The sampling plan is not cross-referenced.

Recommendations - This section should cross-reference the sampling plan since Section 4.0 discusses the technical approach of the investigation but is not specific with regard to the number of samples or their locations.

Section 4.1, Table 4-2 (p. 4-5)

12) Deficiency - Footnotes to the table are incomplete.

Recommendation - Provide footnotes to corresponding numbers and letters given in parentheses for this table.

13) Deficiency - Analysis for U^{238} decay products is not discussed.

Recommendation - Provide discussion as to why decay products will or will not be analyzed.

Section 4.1, Table 4-3 (p. 4-6)

14) Deficiency - CAS numbers have not been provided.

Recommendation - The tables listing compounds for analyses should provide the CAS numbers to insure completeness as well as prevent duplicity in the way of chemical synonyms.

Section 4.1, Table 4-3 (p. 4-7)

15) Deficiency - The analytical categories given are not correct.

Recommendation - The footnotes for this table should be corrected such that the following compound classes are evident.

Table

Sheet 1 = volatiles
Sheet 2,3 = semi-volatiles (acid-base neutrals)
Sheet 4 = pesticides and PCBs

The footnote for Table 4-3 sheet 3 of 4 should have (b) (c), not (d) (e) since these are semi-volatile not volatile.

Section 4.1 (p. 4-4) 3rd paragraph)

16) Deficiencies - Detection limits for Ru^{106} are not justified.

Recommendations - Section 3.1.3.10 states that the detection limit for Ru^{106} is 172 pCi/L and the MCL = 30 pCi/L. The

text on p. 4-4 states that the detection limits "realized from qualified laboratories for ...Co^{60} in soil should be low enough ... for site characterization and risk assessments." The text states that Co^{60} has the MCL = 100 pCi/L and the contract detection limit = 200 pCi/L. If this is the best achievable detection limit for Co^{60} then the text should clarify that this is the case and state how the risk assessment calculations will handle the data. Ru^{106} has an MCL = 30 pCi/L and the contract detection limit = 172 pCi/L. The text states that special analytical services (SAS) analysis may be required for Ru^{106} because of its MCL and contract CLP detection limit. Presently, there is no justification given as to why SAS would not be required for Co^{60}, as well.

SECTION 5.0 Description of RI/FS Tasks

17) Deficiency - The RI/FS EPA guidance dated March 1988 (OSWER Directive No. 9355.3-01) is not adequately followed.

Recommendation - The referencing of three phases in the FS process was deleted. The EPA guidance document recommends that the RI and the FS be performed concurrently. The guidance also segregates the FS into three different phases, referred to as Development of Alternatives, Screening of Alternatives and Detailed Analysis of Alternatives.

Section 5.1 (p. 5-4) 2nd para.

18) Deficiency - Justification for onsite vs. offsite lab analysis is not provided.

Recommendation - Explain why samples exceeding 5 mrem/hr should be analyzed in an onsite lab.

Section 5.1.2 (p. 5-5) 1st para.

19) Deficiency - Justification for microbial sampling is not given.

Recommendation - The text should clarify why microbial samples will be necessary at this site.

Section 5.1.2 (p. 5-6) 5th para.

20) Deficiency - Lab analysis of background samples is not discussed.

Recommendation - Lab analysis of background sample should be the same as onsite samples to provide a baseline upon which to interpret results.

Section 5.1.6 (p. 5-19)

21) Deficiency - Justification for well locations is not provided as indicated in the text.

Recommendation - The reasons for the selection of the proposed well locations should be provided either in the text or Table 5-2. Table 5-2 (p. 5-22) should provide footnotes describing what the 'objective numbers'refer to.

Section 5.1.6 (p. 5-19) last para.

22) Deficiency - The WAC 173-160 is cited as the reference for monitoring well installation, but no other references are provided.

Recommendation - In addition to WAC 173-160, the Westinghouse Hanford procedures for ground water monitoring well installation specifications and the pertinent sections of the "Hanford Environmental Investigations and Site Characterization Manual" should be discussed. It is important that these references/documents do not contain conflicting requirements or guidance.

Section 5.1.6 p. 5-25 1st para., 3rd bullet

23) Deficiency - Wells that are part of the monitoring program are not given in this section.

Recommendation - The statement regarding wells for sampling and analysis should clarify that the wells listed in Table 5-3 (existing and proposed wells) will be included in the monitoring program for the 200-BP-1 area. Presently, the statement is that Table 5-2 and Task 6 wells are part of the monitoring program, but these are one in the same set of wells (i.e., proposed wells).

Section 5.1.10 (p. 5-32)

24) Deficiency - The purpose for and procedure for column vs. sorption tests is not clear.

Recommendation - The purpose for the column tests vs the sorption tests appear to have some overlap. Presently, the column test description implies that vadose zone water infiltration rates data will be acquired, but in addition, the tests are to investigate the mobility of contaminants. The purpose of the sorption tests is to estimate the partition sorption coefficient relative to the movement of contaminants between the aquifer matrix and the water phase.

The discussion should be reevaluated to clarify the similarities, differences and purposes between the two tasks.

Section 5.1.13 (p. 5-38)

25) Deficiency - The risk assessment process is not adequately presented.

Recommendation - The Superfund baseline, PHE process consists of the following five steps:

Step 1 - selection of indicator chemicals
Step 2 - estimation of exposure point concentration of indicator chemicals
Step 3 - estimation of chemical intakes
Step 4 - toxicity assessment
Step 5 - risk characterization

Section 5.1.13.2 (p. 5-40)

26) Deficiency - A discussion on step 3 is missing; it should be included.

Recommendation - The discussion on Exposure Assessment should include the following:

Step 2-a identify exposure pathways
Step 2-b estimate exposure point concentrations
Step 2-c compare requirements, standards, and criteria

The text presents a discussion of step 2-a (see PHE p. 39, EPA 1986), but does not include steps, 2-b and 2-c. If a summary of the process is to be given, it should be complete, otherwise the guidance may not be adequately followed.

Section 5.1.13.3 (p. 5-41)

27) Deficiency - The sources for toxicity assessment data are not fully presented.

Recommendation - The toxicity assessment section should state that the EPA's verified reference doses (RfD), evaluations by EPA's Carcinogenic Assessment Group, and Health Effects Assessments Documents (HEA) developed by EPA's Office of Research and Development serve as the sources for critical toxicity values for the Superfund public health evaluation process.

Section 5.1.13.6 (p. 5-42) (New Section Proposed)

28) Deficiency - The risk assessment discussion is not complete.

Recommendation - This section should be added:

"Remedial Alternatives Risk Analysis"

The discussion presented below or its equivalent should be included in this proposed new section:

"The preparation of the baseline public health evaluation (PHE) should be performed concurrently with the feasibility study's conceptual development of remedial alternatives. Each of the proposed remedial alternatives should be evaluated to determine its ability to meet specific remedial action performance goals and associated risks of implementation. The steps in the baseline PHE should be reevaluated based on the potential for additional remedial action technology . A technology such as air stripping may require modification of the chemicals of concern since some

may have a greater propensity for their release than other technologies."

Section 5.2.4, p. 5-46

29) Deficiency - No mention is made of process options in Section 3.4.2 or Table 3-17.

Recommendation - Section 5.2.4 refers to technology types and process options presented in Section 3.4.2. The text should present the process options to complete the section.

Section 5.2.5.2 p. 5-47

30) Deficiency - The text incorrectly assumes technologies have been screened at this step for technical implementability.

Recommendation - Technical implementability should be considered during screening of technologies. The second sentence in this section states that "technical implementability has already been established at this point", but this is in fact the first opportunity in the process to consider it. Technical implementability is an important screening step.

Section 5.3.1.2 (p. 5-49)

31) Deficiency - The subsection heading is inappropriate.

Recommendation - The heading "5.3.1.2 Define Media and Process Options" should be changed to "5.3.1.2 Refine Extent/Volume of Contamination and Refine Process Options".

Section 5.3.5, Table 5-6 (p. 5-52)

32) Deficiency - Vitrification is not identified as a potential technology with treatability study requirements.

Recommendation - Vitrification has been mentioned several times up to this point in the text. It should be listed in Table 5-6 since it is an innovative process option and will require treatability testing.

Sections 5.3.6, Table 5-7 (p. 5-54) & 5.5.4, Table 5-8 (p. 5-63)

33) Deficiency - The outline is not consistent with the test on page 5-51. Currently, the outline only refers to Phase II.

Recommendation - The reference to Table 5-7 on page 5-51 refers to preparation of an interim FS report. The interim FS report is said to consist of Phases I and II material. As such, Table 5-7 should be revised to reflect Phases I and II.

Section 5.5.2.4 (p. 5-60)

34) Deficiency - Current version of the "Remedial Action Costing Procedures Manual" (EPA, 1985) is not cited.

Recommendation - This document was issued as a final version in 1987; substantive changes in the final version were not made, but the work plan should cite the final version.

35) Deficiency - Justification for a 5% discount rate is not given.

Recommendation - Show supporting documentation for the use of a 5 percent discount rate.

Section 5.5.4 (p. 5-62)

36) Deficiency - The number of screening criteria is incorrectly cited.

Recommendation - The reference to seven criteria in the latter part of the paragraph should be corrected to state nine criteria.

Section 5.5.5 (p. 5-62)

37) Deficiency - Protocol for writing the Proposed Plan is not given.

Recommendation - The paragraph should be revised to clarify that the Proposed Plan is prepared in conjunction with the FS Phase III report, in accordance with the Section 7.3.7 of the Action Plan.

38) Deficiency - Reference to guidance in writing the Proposed Plan is not given.

Recommendation - The text should state that the Proposed Plan will be written in accordance with EPA guidance (OSWER Directive 9355.3-02, EPA, March 1988). The EPA guidance addresses how the (1) nine criteria analysis and (2) statutory determinations required under Section 121 of CERCLA should be addressed. EPA issued the memorandum "Important Considerations for Proposed Plan and Records of Decisions (Henry L. Longest, Director, Office of Emergency and Remedial Response, EPA, August 4, 1988) in which

reference was made to the HQ review of proposed plans and records of decisions with the goal of checking for consistency across the country. This section should state that this review process and the proposed plan guidance, as well as the direction contained in the Action Plan, will be followed.

APPENDICES

Appendix B -

39) Deficiency - The present text is not clear with regard to what sample frequency and analysis type were performed and why. The corresponding data and sample locations presented are not apparent when compared with figures B-1 and B-2.

Recommendation - Clarify the text and figures to relate the grid sampling sites and the fenceline and operable unit area sampling plots in the 200 East Area.

Appendix D -

40) Deficiency - Tables should be corrected to state detection limit, rather than detention limit.

Recommendation - Revise the table.

Appendix F -

41) Deficiency - A figure showing the sampling sites is not provided.

Recommendation - Provide a figure with sampling sites.

Appendix H -

42) Deficiency - The corresponding data and sample locations presented are not apparent when compared with figure H-1. The text discusses grid site vegetation results, but the referenced figures, H-1 and H-2, do not reflect the discussion. Numbers 1 to 36 in those figures are not identified in the text or tables.

Recommendation - Correct the text and/or figures.

PROJECT WORK PLANS

Sampling and Analysis Plan

43) Deficiency - The Environmental Investigation Instructions (EII) have not been provided, yet they are the basis for all the procedures to be followed during the field investigations.

Recommendation - The EII's must be reviewed prior to work plan approval to insure that EPA, DOE and Ecology requirements are incorporated and that procedural conflicts are avoided.

Field Sampling Plan

Section 1.1 (p. Atla-1)

44) Deficiency - In the second paragraph, unplanned releases are referred to as "UPRs". The rest of the text refers to "UNs".

Recommendation - Standardize the terms.

Section 2.2.7 (p. Atla-10)

45) Deficiency - The protocol for field blanks and travel blanks of pure silica for source soil samples is not given.

Recommendation - If silica blanks are to be used, the protocol should be referenced. The protocol will have to be reviewed as use of silica blanks is not standard CLP practices.

Section 2.3.5 (p. Atla-16)

46) Deficiency/Recommendation - The first sentences should have the term standard operating procedures rather than 'proceeding'.

Section 2.3.7 (Atla-18)

47) Deficiencies - The type of sample jar in which vadose soil samples are to be collected is said to be a 3.7 liter wide mouth polyethylene bottle. The work plan does not specify the types of sample collections jars to be used to for each sample analysis. QA/QC analytical protocol for a full range of target compound list and metals analysis requires specific VOA, glass and polyethelene jars.

Recommendation - The written protocol should indicate the specific jars to be used for each analysis or an approved standard plan should be referenced and followed.

Quality Assurance Plan -

Section 1.4 (p. At1b-3)

48) Deficiency - Section 3.0 and Table 3-1 referenced here do not give the analytical procedures to be used for samples collected, as stated in the text; they give the analytical results of the previous investigations.

Recommendations - Correct text to reference sampling plan instead, since it provides the number of samples, locations and types of analysis. The text should also be clarified to state that section 4.0 and Table 4-1 provide the data quality objectives (DQO) to be followed.

Section 3.0 (p. At1b-6)

49) Deficiency - The level II DQOs are missing.

Recommendation - The level II DQOs should be provided and they should be consistent with the Data Quality Objectives for Remedial Response Activities (EPA 1987) and the discussion given in Section 4.1 (p. 4-1)

Table 3-1 (AT1b)

50) Deficiency - The level II analytical procedures referenced in Table 3-1 are missing.

Recommendation - Level II procedures should be provided and they need to meet EPA CLP, QA/QC methods for radiological procedures.

Section 11.0 (p. At1b-24)

51) Deficiency - Laboratory CLP methodology for preventive maintenance are not referenced.

Recommendation - The text should reference that the laboratories doing level III and IV analysis should have preventive maintenance in accordance with the CLP methodology.

Section 13.0 (p. Atlb-24)

52) Deficiency - Corrective action methodology is not discussed.

Recommendation - The text should state that corrective actions will be carried out in accordance with the DOE, EPA, and Ecology Agreement.

Section 2.3.5 (p. Atla-16)

53) Deficiency - Not enough background has been given on the distribution lines to determine whether they are pressure lines or gravity flow lines; and if pressure lines, whether they are high or low pressure.

Recommendation - Provide clarification on this subject.

54) Deficiency - The use of a tracer gas test is dependent upon several factors which are not discussed.

Recommendation - Two major factors of concern are: (1) the physical condition of the system to undergo a high pressure test as identified and (2) how the system was placed. If the distribution system is in granular bedding, the tracer gas test would probably not yield usable information. A discussion of these two factors should be included and

considered when the tracer gas test is being performed.

55) Deficiency - Alternatives to reduce the number of soil gas probes, but still improve results was not discussed.

Recommendation - The tracer gas test method presented is very complex and probably very costly. To reduce the number of soil gas probes and further isolate the potential leaks, the probes could be placed in the vicinity of joints, valves and other appurtances, which are most likely to leak, based on the as-built drawings. Chances are that the steel pipe sections are longer than 10 feet (the spacing suggested) and could reduce the number of probes required.

Section 2.6.5 (p. Atla-26), 3rd para.

56) Deficiency - Field screening procedures for drill cuttings are not adequate.

Recommendation - It is stated that drill cuttings will be captured and tested for radioactivity. It would also be advisable to perform composite tests for other contaminants before disposing to "the ground in adjacent areas".

Health & Safety Plan

57) Deficiency - The plan is not task specific. The plan states a pre-job safety plan (PJSP) will be prepared for each work site. Consequently, each one of these plans will have to be reviewed.

Recommendation - Health and Safety plans should be task specific rather than presenting a range of personnel protection options from which to choose for each task. When

there is a range of options, the Health and Safety officer still needs to choose a level of protection and identify other task-related hazards, monitoring requirements, action levels, and contingency options.

Prior to going out and performing field tasks, particularly drilling and trenching/excavation tasks, a health and safety plan should be prepared which identifies procedures on a task-specific basis. This plan is not task specific, but it is anticipated the PJSP, to be provided at a later date, will have these items addressed:

- o level of protection
- o expected hazards (including chemical and radiological contaminants - alpha, beta, gamma)
- o type of chemical or radiological monitoring equipment required (alpha scintillation, beta pancake probe.
- o personnel dosimetry

The health and safety plan presented herein addresses most of the project's generic health and safety areas of concern and procedures, but concerns and procedures should be specifically identified by task.

58) Deficiency - Health and safety practices to be followed during drilling and trenching/excavation are not fully described.

Recommendations - Discuss how dumping of radiological monitoring response by wet sludges will be handled. Discuss whether every sample will be field screened for chemical or radiological hazards and what the basis will be for changing levels of protection (eg. action levels).

Section 1.2 (p. At2-3)

59) Deficiency - Reference of the Hanford Policy relative to health and safety practices was not provided.

Recommendation - The Hanford Policy relative to health and safety practices will have to be referenced and the document reviewed to ensure that practices are consistent with what is presented in this plan.

Section 11.4 (p. At2-3)

60) Deficiency - The term "inexperienced employee" is used but not defined.

Recommendation - Define term or reference document containing "Westinghouse Hanford Introduction Training and Qualification" so procedure can be examined.

Section 3.2 (p. At2-9)

61) Deficiency - The last sentence on page is not complete.

Recommendation - Revise the text.

Section 4.2 (p. At2-17)

62) Deficiency - Protection levels are not fully qualified.

Recommendation - Protection levels should be provisionally stated before work begins.

Section 4.2, Table 4.1 (p. At2-16)

63) Deficiency - Permissible exposure levels (doses) are not listed on this table.

Recommendation - Permissible exposure levels should be listed.

Section 4.2, Table 4.2 (p. At2-17)

64) Deficiency - Warning properties such as description of odors is not provided.

Recommendation - Warning properties for the most prevalent are likely to be encountered chemicals should generally be included in a health and safety plan unless none are available.

65) Deficiency - The table references "sampling results" but does not define what this means.

Recommendation - Clarify whether there are field screened (eg. photoionization detector, organic vapor analyzer, radiological pancake probe) sampling results performed at the time to make a decision on whether to down-grade or up-grade; or if these are sampling results from previous surveys.

Section 5.0 (p. At2-19)

66) Deficiency - Frequency of field monitoring is not given.

Recommendation - Clarify how often monitoring will occur. Will it be done at specified intervals or continuously?

Section 5.2 (p. At2-21)

67) Deficiency - Details regarding monitoring equipment are not provided.

Recommendation - The type of lamp (e.g., 10.7 or 11.2 ev) to be used should be provided since they have a different sensitivity range. The type of lamp used is determined by the types of contaminants likely to be encountered.

Section 5.5 (p. At2-27)

68) Deficiency - The type of double bag to be used for contaminated heavy equipment is not given.

Recommendation - If double bagging will be an important step to preclude contamination, then the plan or PJSP should specify the quality of bags (eg. 6 mil visqueen or garbage bags) since often low quality bags tear and do not perform their function.

Data Management Plan

69. Deficiency/Recommendation - This plan is, for the most part, duplicate of that provided in the original 1100-EM-1 work plan. Therefore, the following is a repeat of comment #95 from our March 17, 1989 comments on that work plan.

A. A list of databases with abbreviations and a summary of their purpose should be provided at the end of this

section.

B. Project data management should standardize chemical nomenclature in accordance with the following:
   - o Use of standardized IUPAC nomenclature used by the American Chemical Society
   - o List chemicals by the Chemical Abstracts Service (CAS) number.

   This recommendation is made to preclude errors pertaining to the following:
   - o Faulty health and safety recommendations
   - o Faulty regulatory data interpretation
   - o Duplicative or missing database storage.

Project Management Plan

70. Deficiency/Recommendation - This plan is, for the most part, duplicate of that provided in the original 1100-EM-1 work plan. Therefore, the following is a repeat of comment #13 from our March 17, 1989 comments on that work plan.

   The Project Management Plan contains numerous inconsistencies with the current version of the Action Plan (an attachment to the Hanford Federal Facility Agreement and Consent Order). These inconsistencies are the result of two general problems:
   1. This work plan was written sevral months ago and referenced the version of the Action Plan that was drafted at that time. The Action has undergone several revisions since, as was finalized on May 15, 1989. The Action Plan specifies the procedures that must be followed in the CERCLA process. If there are

inconsistencies between the work plan and the Action Plan, the work plan must be changed to conform to the Action Plan. It is recommended that the majority of the Project Management Plan simply reference the Action Plan by the appropriate section. In this way, most of the narrative portion of the Project Management Plan can be deleted and inconsistencies will be totally avoided.

2. In many cases, the narrative and figures in the Project Management Plan have been paraphrased from wording in the Action Plan, resulting in a slightly different meaning. Again, the recommendation for referencing the Action Plan, as stated above, will correct this problem. For any narrative content or figure that must be left in the Project Management Plan for clarity and for which there is comparable section in the Action Plan, the specific language of the Action plan must be stated verbatim.

GROUP II

71) Deficiency - The water table map shown in figure 2-14 indicates that ground water in the 200 Area West has a north-easterly flow component, and the nitrate plume shown in figure 3-2 indicates that nitrate has migrated in the unconfined aquifer from the 200 Area West to the area downgradient of the 200-BP-1 operable unit. However, no mention is made in the work plan of the 200 Area West as a possible source of contaminants in wells downgradient from the 200-BP-1 operable unit.

Recommendation - A discussion of the 200 Area West as a possible source of contaminants in wells downgradient of the 200-BP-1 area should be included in section 2. Well 47-60 should also be added to the monitoring well network (and listed in table 5-3) to monitor the quality of ground water flowing from the direction of the 200 Area West.

72) Deficiency - As stated on p. 2-23 and shown in Table 2-3, there is considerable variability in the quality of ground water in the unconfined aquifer, some of which can be attributed to natural variability. Due to possible influences from other operable units, upgradient water samples will not be useful to determine the natural background quality of ground water in the vicinity of the 200-BP-1 operable unit, and no other sampling has been proposed to establish the natural quality of ground water in this area. The assessment of background water quality is important for interpreting the results of water quality sampling and in the development of remediation strategies.

Recommendation - Review existing data to determine if water quality samples have been taken from wells unaffected by contamination and report these data. If such background data do not exist, select five appropriate wells in the vicinity of the 200 Areas which have been unaffected by contamination from the 200-BP-1 operable unit and collect and analyze water samples quarterly for one year. Due to the widespread contamination of ground water from the 200 Areas, wells may need to be selected that are relatively far from the 200-BP-1 operable unit.

73) Deficiency - As described on p. 4-15, defining the surface contour of the Elephant Mountain basalt is important to locate areas in which the Rattlesnake Ridge aquifer is in direct contact with the overlying unconfined aquifer. If, as expected, the Elephant Mountain basalt is found to be breached, it will be important to identify the confining layer which defines the lower boundary of the water table aquifer; presumably this will be the Pomona basalt. The continuity of the Pomona is not described in the work plan.

Recommendation - The properties and continuity of the Pomona basalt should be discussed in Section 2 along with supporting evidence that it also has not been breached. If this evidence is not available, definition of the surface contour of the Pomona basalt in the vicinity of breaches in the Elephant Mountain basalt should be added to Task 5, "Seismic Refraction Surveys."

74) Deficiency - Water quality data from well 53-55 and several other wells downgradient of 200-BP-1 were not included in Appendix D or E. Well 53-55 is shown in figures 3-4 and 3-5 to be just outside the total beta and cyanide plumes, and water quality data from this well would provide a useful

comparison to that from wells 49-55 and 50-53 which are within the plume.

Recommendation - List water quality data from at least one well downgradient of cyanide and total beta plumes (preferably well 53-55, if available) and include in Appendix D and E.

75) Deficiency - Well 50-53B is proposed to be installed in the Rattlesnake Ridge aquifer for the purpose of 200-BP-1 plume delineation (table 5-3). Well 50-53B is also located downgradient of the B-pond and ground water in the Rattlesnake Ridge aquifer in this area may be affected by contaminants from the B-pond.

Recommendation - In order to help distinguish the source of contaminants that may be found in samples from well 50-53B, we recommend adding well 47-50 to the monitoring well network (include in table 5-3) to determine the quality of ground water flowing from the direction of the B-pond. This recommendation assumes that well 47-50 has the proper well construction and screened interval to serve as a monitoring well.

76) Deficiency - The location of proposed seismic refraction survey lines does not extend much beyond the western boundary of the 200 Area East (figure 5-5). However, the contaminant plumes, such as nitrate, tritium, and total beta extend north and west of the 200 Area boundary. It is quite possible that at some future date additional monitoring wells will be installed in this area to the north and west, and the definition of the bedrock surface will be useful in siting these wells.

Recommendation - Extend the seismic refraction survey to include two more north south trending lines at approximately the same grid spacing as those shown on figure 5-5 and extend the east-west lines to the new western extent of the grid.

77) Deficiency -. The column leach tests, Task 10, will provide useful information on the transport of contaminants through the unsaturated zone. However, the utility of the results will be limited by compromises required by the nature of the experiment. Although not explicitly stated, it is assumed that the simulated rain application rates and consequent recharge rates will be much greater than what is observed in the field. It could take several years for water applied at the 8 cm/year maximum recharge rate noted on p. 4-19 to be transported to the bottom of the column. Additionally, samples would need to be collected under suction at the collection reservoir.

The application rate that will allow for reasonably quick passage through the soil column and collection of samples under gravity flow will itself cause semi-saturated conditions within the soil column. This relatively high moisture content and relatively rapid flow will differ considerably from what is observed in the field. It is likely that in the relatively dry soils at Hanford, two phase--liquid and vapor--transport occurs, in which vapor phase transport possibly pre dominates. Differences in residence time and transport processes will limit applicability of the column leach test results.

Recommendation - As listed in Appendix I, several models are available to simulate ground-water flow and solute transport in the unsaturated zone. We recommend the selection and use

of an appropriate model (one that includes vapor transport) to supplement the results gained from the column leach tests. Simulations should be done for the recharge rates and moisture conditions of the column leach tests and for those observed in the field, and the resulting flow rates and solute concentrations should be compared. The model should also be used to conduct a sensitivity analysis to evaluate the importance of site characteristics such as moisture content, recharge rate, and contaminant concentrations and their individual spatial variability on the transport of contaminants through the unsaturated zone.

78) Deficiency - Several computer codes are listed in Appendix I as candidates for use in the assessment and evaluation of various waste management options. However, no single code or combination of codes is note as having been selected for the 200-BP-1 RI/FS. Because the computer codes and their data requirements differ greatly from one model to another, it is not possible to evaluate whether these data requirements are met by the work plan.

Recommendation - We assume that since PORFLO-3 and UNSAT-H were developed for Hanford and that personnel at Hanford are familiar with their use, these models will be used for the RI/FS. If this is the case, please note it in the work plan, and if it is not the case, describe which models have been selected and give a brief summary with references of their capabilities and data requirements.

79) Deficiency - According to figure 2-16, ground water in the Rattlesnake Ridge aquifer has a westerly flow component in the vicinity of the 200-BP-1 operable unit. However, no monitoring wells are installed in the Rattlesnake Ridge

aquifer west or northwest of the 200-BP-1 operable unit.

Recommendation - We recommend installing a monitoring well in the Rattlesnake Ridge aquifer to the northwest of the 200-BP-1 operable unit. The well should be located approximately equidistant between wells 49-57, 47-60, and E32-1. The purpose of the well is provide identification of potential contamination from the 200-BP-1 operable unit in the apparent downgradient direction of ground-water flow n the Rattlesnake Ridge aquifer. This monitoring well will also help provide a more precise definition of the potentiometric surface of the Rattlesnake Ridge aquifer in the vicinity of the 200-BP-1 operable unit. While drilling this well, we suggest that additional water samples be taken in the unconfined aquifer as it is being drilled to depth. The use of a multi-port sampling device may be advisable in order to maintain a permanent sampling location within the unconfined zone.

80) Deficiency - Groundwater monitoring data for the unconfined aquifer does not exist in the area immediately north of the operable unit. Contaminant plume maps indicate high concentrations at some distance downgradient of the operable unit, but there is no data to indicate whether higher concentrations exist immediately to the north of the operable unit or whether a 'slug' of contamination has left the operable unit and migrated northward, leaving lower concentrations of contaminants near the operable unit. This is an important piece of information in characterizing the plume and looking as potential alternatives for remedial action.

Recommendation - Provide at least one additional monitoring well into the unconfined aquifer directly north of the operable unit (just north of the fence line), in line between the operable unit and well 50-53. Depending on the water chemistry found in this area, additional wells near the operable unit may be required in order to adequately characterize the plume.

81) Deficiency - Figure 2-16 indicates that there may be a westerly flow component located in Rattlesnake Ridge aquifer. If this is the case, the proposed well into this aquifer (E-33-33) may not be properly located to determine whether contamination from the 200-BP-1 operable unit has occurred.

Recommendation - We recommend that proposed well E-33-33 be relocated approximately 300 feet to the west. As an alternative, discuss why the proposed location is preferable. It should be noted that contamination of the confined aquifer is found at either location, additional wells in this area will be required.

82) Deficiency - The local geologic setting and stratigraphy are described in general terms in section 2. However, detailed information on the stratigraphy in the immediate vicinity and to the north of the 200-BP-1 operable unit is not included in the work plan. Figures 2-6 through 2-11 show the Hanford Formation as undifferentiated sediments. This lack of information makes it difficult to comment on the placement and length of well screens and to evaluate the appropriateness of vadose sampling and column leach tests.

Recommendation - Numerous wells have been drilled both in the 200-BP-1 operable unit and in the downgradient

direction of ground-water flow to the north. We recommend including in section 2 or in an appendix, detailed well logs from several wells representative of the 200 East Area, 200-BP-1 operable unit, and the area to the north.

Miscellaneous Comments

83) Page iii in the table of contents was missing.

84) Page 2-6. Paragraph 4 states that Waste Unit UN-200-E-9 involved 41,000 liters of supernatant waste in an area directly north of the 216-B crib flush tank, and a location for UN-200-E-9 is shown within the 200-BP-1 operable unit on figure 2-2. Yet, paragraph 6 states that it is unknown whether the UN-200-E-9 release flowed into the 200-BP-1 operable unit. These statements appear to conflict with each other.

85) As shown in figure 2-11 and as stated on 2-19, the basalt bedrock surface dips to the southwest of the 200-BP-1 operable unit. It is assumed that high-density organic compounds were not discharged to the 200-BP-1 operable unit. However, if these compounds are found in the initial source characterization study, additional monitoring wells will need to be installed to the bedrock surface to the west and southwest of the 200-BP-1 operable unit.

86) Figure 2-13, page 2-20 was missing from the report.

87) Page 2-21, paragraph 1, last sentence. "(13 to 18 feet)" should read "(3 to 18 feet)."

88) Page 2-21, paragraph 3. The citation for the U.S. Bureau of Reclamation, 1979, is not included in the list of references.

89) Figure 2-14 and figure 2-15, pages 2-22 and 2-24, respectively. The 5 and 10-foot contour intervals used in these figures are useful in showing the regional direction of groundwater flow. However, the groundwater profile in the vicinity of the 200 Area East appears to be relatively flat, and the 5 and 10-foot contour intervals shown in figures 2-14 and 2-15 are not precise enough to adequately characterize the direction of groundwater flow in the immediate vicinity of the 200-BP-1 operable unit. We therefore recommend adding another figure that shows the water table in the immediate vicinity and to the north of the 200 East Area plotted with 1-foot contour intervals. We recommend using the most recent data and noting in the explanation the date at which water levels were measured.

90) Figure 2-15, page 2-24. Note the date of the water table map in the title or explanation.

91) Figure 2-17, page 2-29. Note the date of the potentiometric surface map in the title or explanation.

92) Page 2-33, paragraph 1, the citation for PNL, 1978, is not included in the list of references.

93) Page 2-39, paragraph 3, the 400 area is not really "hydraulically up gradient from 200-BP-1" but is rather on the other side of an artificial ground-water divide. As artificial recharge to the B-pond is cut back, the groundwater divide will likely disappear and the 400 area will be downgradient from the 200-BP-1 operable unit. Reword the statement to be more precise. As a suggestion: "These wells are not presently hydraulically downgradient from 200-BP-1."

94) Page 3-1, paragraph 3. The citation for WHC, 1982b, is not included in the list of references.

95) Table 3-3, page 3-6. Numerous wells are listed as having a maximum depth of the screened interval greater than the well depth; for example, wells 2-E33-4 and 6-53-55A. What is meant by "well depth"?

96) Wells listed on page 3-5 have a prefix of 299 or 699, wells in table 3-3 have a prefix of 2 or 6, and wells shown on figure 3-8 have no prefix. There should be some consistency to avoid confusion. We suggest using 2 or 6 prefix or dropping the prefix altogether.

97) Page 3-9, paragraph 6, states that cobalt-60, which is relatively immobile, appears to be chemically complexed and mobilized by cyanide. However, on page 5-28, paragraph 1, the cobalt-cyanide complex, Co(Cn)6-3, is described as relatively insoluble and likely to sorb onto sediments or soils. Are there other, more mobile, cobalt-cyanide complexes occurring in the 200 area subsurface environment? If not, these two statements appear to be in conflict.

98) Page 3-12, figure 3-4. Shows the plume in the 200-BP-1 operable unit with total beta levels between 100-1,000 pCi/L. However, technetium, "a major contributor to total beta concentration" (p. 3-14), ranges as high as 4,700 pCi/L in wells in the 200-BP-1 operable unit. Figure 3-4 therefore appears to under report the total beta concentrations, both in the 200-BP-1 operable unit and downgradient in the vicinity of wells 50-53 and 49-55A.

99) Table 3-8, page 3-33. The column headings "Ra" and "InCo" are unclear. Are these abbreviations for "Radionuclides" and "Inorganic Constituents"? If so, please spell them out.

100) Page 3-34, paragraph 2. Some mention should be made that radionuclides are in excess of Federal and State drinking water standards as shown in table 3-7 on page 3-29.

101) Figure 3-6, page 3-37. In the explanation, identify the finer lines appearing in the figure. Are they secondary exposure routes?

102) Page 3-51 was missing from the report.

103) Table 4-2, page 4-5. It is unclear what the numbers in parentheses represent. These numbers (1-4) do not match the letter footnotes below nor are they associated with any references.

104) Page 4-15, paragraph 2, and page 4-19, paragraph 4. We assume that the hydraulic conductivity and density mentioned in these paragraphs will be the unsaturated hydraulic conductivity and the bulk density. If so, be specific and say so. What is the range of moisture contents for which the unsaturated hydraulic conductivities will be measured?

105) Page 4-15, paragraph 4. The work plan for the 1100-EM-1 operable unit used the unofficial designations of "Hanford Formation" and "Pasco Gravels" not "Hanford Gravels" as used here. Recommend adopting similar terminology between operable units. In this paragraph, use "Pasco Gravels" or "gravels in the Hanford Formation."

106) Page 4-15, para graph 4, last sentence. If the site characterization work identifies contamination of the confined Rattlesnake Ridge aquifer, the hydraulic characteristics of the confined aquifer will also need to be defined.

107) Page 4-16, paragraph 1. The samples taken at a depth of 5 feet are described as "surface" samples. This is relatively deep to be described as surface and may lead to confusion with the samples taken at 1-foot depth as described in paragraph 3 and shown in figure 5-3. We recommend using the term "near surface" or "shallow" to describe the 5-foot-depth samples.

108) Page 5-6. The boreholes for cribs 216-B-43 through 50 are noted as being approximately 5 meters in depth in figure 5-1 and 8 meters in depth in figure 5-3. The boreholes for crib 216-B-57 are also noted as being approximately 4 meters in depth in figure 5-2 and 6 meters in depth on page 5-6. The depth of boreholes noted in figures 5-1 and 5-2 should be corrected. Also, figure 5-1 has no scale. If cribs 216-B-43 through 50 are all the same size, a scale for figure 5-1 would be appropriate.

109) Page 5-6, paragraph 1. The borings in the 600 area for collection of background samples should be drilled to 8 meters to match the depth of the crib borings, not 5 meters as noted here.

110) Figure 5-4 on page 5-9 is out of order with figure 5-3 which is on page 5-13.

111) Page 5-18, objective 6. "Stratigraphy" is a better term than "stratification."

112) Page 5-19. The 12-inch-diameter surface casing is noted to be installed to a 20-foot depth in paragraph 2, but is shown to extend only 5 feet below land surface in figure 5-8.

113) Page 5-24, paragraph 3, line 2. "Soil" rather than "soils."

114) Page 5-24, paragraph 5, line 2. Suggest wording be changed from "three soil samples from each aquifer. Three samples from..." to "three soil samples from each aquifer penetrated. These samples from..." to remove possible ambiguity.

115) Page 5-25, activity number 3, first sentence. The wells included in table 2 are the wells to be installed during Task 6. The statement seems redundant. Should it read "wells included in table 5-3 and..."?

116) Page 5-28, paragraph 2, line 4. Should probably read "sodium cyanide" not "sodium hydroxide."

117) Plate 6-1. On the top of the graph, "DEC 89" is mislabeled as "DEC 88."

118) Atla-10, paragraph 4. The archived soil samples are not likely to be useful in Tasks 9 and 11, the biota survey and hydraulic pump tests. They will more likely be used in Tasks 10 and 12, the column leach tests and sorption tests.

119) Atla-26, paragraph 1, figure 2-6. Atla-27 does not include the tentative locations of any new wells as stated here. See figure 5-6, page 5-20, for the location of proposed monitoring wells.

120) Figure 2-7, page Atla-28. Numerous wells are mislabeled on this figure:
E33-28 should be E33-31
E33-29 should be E33-32
E33-30 should be E33-33
52-54 should be 52-57
52-57 should be 52-54
Well 48-50 is not labeled
Two wells are labeled 55-57; the well to the east should be 55-55. Compare to figure 5-7, page 5-21, for reference.

121) Page Atla-33, paragraph 2. As described here, ground-water samples will be taken semiannually from existing and new wells; whereas on page Atla-37, one year of quarterly sampling is noted. We recommend changing Atla-33 and the title of table 2-5 to be consistent with page Atla-37.

121) Page B-14. Arrow should point to well 2E-N not 2E-NE as shown.

122) Page Atla-50, paragraph 4, line 3. Personnel should be required to remove all protective gear upon "exiting" the designated work area, not "entering" as stated here.

123) Plate 6-1. It is not clear from the sampling and analysis plan or the project management plan what constitutes the critical path shown on plate 6-1. Some definition of what constitutes the critical path should be included. For instance, why is source sampling, surface and near-surface sampling and analysis, and vadose zone soil sampling and analysis not included in the critical path as shown on plate 6-1.

GROUP III

GENERAL COMMENTS

124) The nomenclature should be consistent; i.e., the BP-1 cribs are referred to as simply "B-43 to B-50 cribs" in section 2, and in the maps in this section. In section 3, the cribs are identified by the older name of BY cribs.

125) Many of the figures are not legible; i.e., Figure 2-9, and many of figures in Appendices B and C.

126) "Hanford Formation" should be "Hanford formation" because it is an informal name.

127) The most recent, applicable references should be cited. For example, Graham, 1984 and Graham, 1981, are continuously referenced. Is there more recent information available? If so, incorporate it into the text. See comments 139, 140, 142, 154, and 180 below. B-Pond has been enlarged and Gable Mountain Pond has been decommissioned since the time of these reports.

128) References in text are abbreviated, while the references listed in the back are written out completely; i.e., PHS 1988 is U.S. Public Health Service in the reference list. If it is to be written out in the back include the abbreviated name in the list; so that it would appear as U.S. Public Health Service (PHS).....

129) Some sampling is to be done at B-61 crib to determine if any wastes had been disposed to this crib; however, there is never any mention of what is to be done if wastes are found

in this crib. There should be a contingency if contaminants are found here, or why sample at all?

130) Disposal of water from aquifer testing involves an area of policy that must be resolved in the near term so that it is does not become a limiting factor in conducting aquifer tests. A means of disposal of such waters that would allow the tests to be conducted, especially in areas of concern, is essential to the ongoing well drilling program. The critical areas are normally those which contain the greatest contamination. If data is necessary to determine the type of remedial action that can be taken, aquifer tests may be required to determine the aquifer characteristics in this area.

131) Both EPA and Ecology should have input into plans for testing of new procedures such as those that may be planned for the treatability testing. This is the type of problem that has occurred in the in-situ vitrification pilot project. If the regulatory agencies can communicate what is acceptable, money and time can be saved.

132) Some of the procedures that have not been completed should be reviewed by EPA and Ecology before the BP-1 RI/FS Work Plan can be accepted.

133) The details of which building will be used to analyze or process soil samples, and other samples of 200 counts per minute or greater activity, should already have been determined and should be defined in this work plan.

134) Much of the information included in the attachments are also included in the main work plan. This information can

probably be referenced in one section or the other. The discussion of cyanide in attachment A, for example, is repeated from section 5.1.7.1.

SPECIFIC COMMENTS

135) Section 2.1.2: No mention is made of the "BY cribs" in either the text or maps in this section until it appears in section 3. However, the BY tanks in the operable unit south of BP-1 are discussed.

136) Figure 2-4: Aphryic in the Huntzinger Flow lithology description should be Aphyric.

137) Figure 2-9: This figure has been reduced to the size that some labels are not legible. This applies also to some of the following figures as well.

138) Section 2.2.3.1: The conversion from metric to English units is incorrect in the last sentence; i.e., 1 to 6 meters (13 to 18 feet) should be 1 to 6 meters (3 to 18 feet).

139) Section 2.2.3.1.1: The last sentence refers to "between 0 and 8 centimeters/year (0 and 2.8 inches/yr)" which should be "between 0 and 8 centimeters/year (0 and 3.1 inches/year)". There is more recent data available from Gee, G.W., M.L. Rockhold and J.L. Downs, 1989, Status of FY 1988 Soil-Water Balance Studies on the Hanford Site. PNL-6750 Prepared for the U.S. Department of Energy by Pacific Northwest Laboratory, Richland, Washington 99352.

140) Section 2.2.3.1.4 and .5: There is more recent data available than Graham, 1981. The more recent data should be incorporated into this work plan. How can the means, standard deviations, and ranges for the various constituents of the two data sets be compared in a publication from 1981 when the data was collected from 1974 to 1987?

141) Figure 2-15: When was the data collected that was used to construct the contours for this figure?

142) Section 2.2.3.2.5: Can it be there is no recent data available other than Graham, 1981 and Gephart et al., 1979? The BWIP must have conducted some studies in this area in the interim. Since that time, the B-Pond has been expanded and the Gable Mountain Pond has been decommissioned.

143) Section 3.1.2.1: Do 36 grids of 10m x 10m cover the entire 200 East Area or do we presume that they are not adjacent to one another?

144) Section 3.1.3.8: The contract detection limit for ^{60}Co is 200 pCi/l while the MCL is 100 pCi/l. Perhaps the contract detection limit should be changed as is discussed for ^{106}Ru.

145) Section 3.1.5, page 3-18: Second sentence "samples" should be "samplers".

146) Section 3.1.6, page 3-19: First sentence is apparently jumbled. "of cesium-137" should probably follow "concentrations" and "PNL, 1988" should be at the end.

147) Section 3.1.7: What about hazardous wastes? Is investigative sampling conducted entirely on rad wastes?

148) Section 3.3.2.2, page 3-34 third paragraph: The statement "Chloride has been detected fairly consistently ..." might be questioned as to "relative to what?" Also, the last sentence concerning risk is premature and unwarranted.

149) Section 3.3.2.2, page 3-35: Several typos on this page: 2nd paragraph "oppose" should be "opposed"; 5th paragraph "irritant" should be "irritating"; 6th paragraph "assimilates" should be "assimilated".

150) Section 3.3.2.2, page 3-36: Why is the ammonium ion showing up in well 699-49-55A in concentrations in excess of 1 mg/l? Especially considering that ammonium or ammonia are normally found in reducing environments and oxidize readily to NO_2 and NO_3 in oxidizing environments.

151) Section 4.1, page 4-4, second paragraph: What is the reference for the CERCLA-TCL list? 3rd paragraph, 5th sentence "from" should be deleted.

152) Table 4-2: What does the number in parentheses represent?

153) Page 4-11 1st paragraph: There should be a "the" between "repeating" and "analysis".

154) Section 4.1.3.2: The detection level for tritium in routine analyses is 500 pCi/l, so the samples analyzed to levels of 1 pCi/l must have been sent to the University of Miami or some comparable laboratory. Is this data from Graham et al. 1984 or from more recent BWIP reports? Do we have data available for these wells now that the B-Pond has been expanded and Gable Mountain Pond has been decommissioned?

155) Section 4.2.1: What will be done if contaminants are found in 216-B-61 crib?

156) Table 5-1, page 5-2: Are samples to be surveyed before being sent to the laboratory? If so, would this be applicable to the column titled "Radiological Survey"? page 2 of this table - Will there be samples collected before and during aquifer tests to determine influx of any contamination?

157) Page 5-6, first paragraph: See comment 155.

158) Figure 5-4: probably should be page 5-13 and not page 5-9, Figure 5-3 should be on page 5-9.

159) Page 5-15, last paragraph: Is "gross gamma" the same as "natural gamma"? Many geophysical logs from the Hanford Site are labelled "natural gamma"; perhaps the same nomenclature should be maintained.

160) Section 5.1.10, last paragraph: Something is missing from the third sentence.

161) Section 5.1.11: Disposal of water should not be a limiting factor, as stated earlier. A method of discharge may have to be devised that would meet environmental requirements and still allow testing of the aquifer.

162) Section 5.1.11, page 5-35: Before conducting slug tests, water levels should be monitored for 1/2 day to determine trends in the water level or the transducer equipment. Removing a slug of water is a "withdrawal" test; conversely, adding water or a weight to the well is "displacement".

163) Page 5-37, last paragraph: Is the ratio of 1.0 ground water to test soil measured by volume?

164) Page 5-38, second paragraph: Sorption/desoprtion should be sorption/desorption.

165) Section 5.4.3: EPA/Ecology should have input into plans for testing of new procedures in order to minimize any problems of acceptability by the regulatory groups. If the input is provided well enough in advance during planning, factors that may be essential to acceptance, such as ground-water monitoring or documentation, will be included in the study.

166) Section 5.5.2: Nine evaluation criteria are listed at the beginning of this section and yet only seven are discussed in any detail. What happened to the other two criteria?

167) Section 5.5.4: In one paragraph we go from nine criteria to seven criteria. Where are the missing criteria?

168) Section 6.0: The schedule is discussed and the bullet that describes time necessary to develop technical procedures does not include the time necessary for the EPA/Ecology to review these procedures.

169) Section 7.0: See comment 128.

170) Plates 2-2, and 2-3 and Figures B-2, those in Appendix C, G-1, and G-2 are not legible in places.

171) Table 1-1, Attachment 1: These procedures will need to be reviewed by EPA/Ecology before work plan can be okayed.

172) Page At1a-4, Section 2.2.3: "Conducting" should be "conducted".

173) Page At1a-7, Section 2.2.5: Will samples be taken to 2706-T facility or some other place? This must have been decided by now, if so, it should be included in the work plan.

174) Page At1a-10, first paragraph: See comment 155.

175) Page At1a-16, middle paragraph: The word "values" should be "valves". Also under Soil Survey, how are the soil probes constructed? Will betas be able to penetrate this material?

176) Page At1a-18: Throughout this attachment there are references made to various procedures. We should probably have these procedures available to us so that we can conduct a proper review.

177) Page At1a-26, last paragraph: What contractor does WHC anticipate doing the geophysical logging? Will it go out for bid?

178) Page At1a-30, 3rd paragraph: What procedures are proposed for purge water disposal? Section 2.6.6 coordinates are to the nearest 1000 ft.

179) Page At1a-34: This information is available already in the work plan in Section 5.1.7.1. It probably is not necessary to repeat it, perhaps in can be included in either the work plan or this attachment. This applies to the next two pages, as well.

180) Page At1a-42, Section 2.10: New information is available in Gee, Rockhold, and Downs, 1989.

181) Page At1a-45, Section 2.11.2: The disposal of ground water discharged during aquifer testing is an issue that is currently being negotiated between Ecology, DOE, and EPA. Resolution of this issue is going to have to occur in the short term and, therefore, should not be a limitation to drilling activities that will be accomplished under this work plan. Modification may be necessary to the work plan, to reflect resolution of this issue.

182) Page At1a-46, Section 2.11.4: See comment 162.

183) Page At1a-51, Section 4.0: See comment 128.

184) Page B-At1b-3, Section 2.4: Are you missing a section at the end of this paragraph?

185) Page At2-4, Section 1.4: Is the 40 hr training supposed to cover strictly hazardous waste materials? Is the radiation, drilling and sampling equipment usage and vehicle training additional to this 40 hr?

186) Page At2-9: There is a section missing at the end of the page.

187) Page At2-16, Table 4-1: This table is not quite accurate since both ^{90}Sr and ^{106}Ru have higher energy daughter radiations namely ^{90}Y and ^{106}Rh. Radiation is not the only hazard from these materials, uranium is also considered toxic.

188) Page At2-17, Table 4-2: Are the values for ammonia correct? They appear inconsistent.

189) Page At2-22, Section 6.1, last complete paragraph: The last sentence seems to indicate that permission from all three individuals; the Health and Safety Officer, the RPT, and the Field Team Leader are required before changes to the specified levels can be made. Is this correct?

190) Page At2-27, Section 9.0: Can the truck horn be heard over the sound of the drilling equipment and the use of ear plugs?

192) Page At2-29, Figure 9-1: There probably should be a map showing the location of the emergency facilities in the 200 East Area. It might prove more useful especially for work conducted in the BP-1 operable unit.

193) Page At2-31, Section 9.7: In the case of eye protection, it should also be stipulated that contacts should not be worn while working in a hazardous work zone. Special glasses are available for this type of work.